

# Dr Róisín Loughran PhD, M.Phil, B. Eng

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## Employment

### *Post-Doctoral Research Fellow Level 2 (previously Level 1)*

#### **Applications of Evolutionary Design (App'Ed), NCRA, UCD** **Nov 2014 - present**

As a Post-Doctoral researcher in the Natural Computing Research and Applications group at UCD my research is centred on applying natural computing methods such as evolutionary computation to aesthetic tasks such as music composition. Throughout this position I have become involved in the fields of Computational Creativity and Creative AI. I am particularly interested in the autonomous adjudication, evaluation and generation of aesthetic artefacts and processes such as music. The development of autonomous agents in creative domains offers huge potential in the areas of artificial life and the progress towards general artificial intelligence.

Since starting this post I have had multiple peer-reviewed conference papers published and presented at international conferences. In 2017 I have published articles in the Journal of Evolutionary Intelligence and the Journal of Creative Music Systems. I have furthered my teaching experience in co-delivering the module 'Computational Modelling for Business' to third year Business students, including setting and marking the assignments and exams. I have also proposed, secured funding for, hosted and chaired the first music technology workshop entitled 'MusTWork16: Establishing a Partnership Between Music Technology, Business Analytics and Industry in Ireland' in UCD on June 10<sup>th</sup> 2016.

### *IT & Media Coordinator*

#### **Complex & Adaptive Systems Laboratory (CASL), UCD** **April 2013 – Oct 2014**

As the IT & Media Coordinator for CASL and the Earth Institute in UCD, I was responsible for the on going technical and media issues that arose within the Institutes. This role was adaptive by nature and gave me the opportunity to work on a variety of tasks and projects. I offered IT support on Mac, Windows and Linux platforms, along with peripheral hardware such as printers, swipe-card access, AV Conferencing equipment and digital signage. In addition to this, I created promotional media such as photographic and film pieces for the Institute and individual research groups where appropriate. I administered the CASL SQL databases, virtual servers, all Social Media productions and website issues. I liaised with UCD IT support on networking issues and assisted the Computational Support Specialist when necessary.

### *Substitute Lecturer – Music*

#### **Dundalk Institute of Technology**

**Feb 2010 – June 2010**

I was a substitute lecturer on a part-time basis in the subjects of Elements of Composition, Recording Techniques and Technology in Music Education to Undergraduate students at Dundalk Institute of Technology. I started mid-way through the semester at short notice to prepare and present classes. I set and corrected the end of semester examinations and participated within the school in departmental meetings.

### ***Lecturer/Teaching Assistant – Music/Music Technology***

**University of Limerick**

**Jan 2007 – Dec 2008**

While completing my PhD at the University of Limerick I undertook a number of teaching positions:

- Teaching Assistant in Digital Media for Undergraduate students in Autumn 2008.
- Lecturer in Music Theory to both Masters and Undergraduate students in Autumn 2007.
- Teaching Assistant for Digital Signal Processing for both Masters and Undergraduate students in Spring 2007.

In addition to scheduled classes I tutored individual students through the IT Learning Centre in UL.

### **Funding Awards**

R15723: Science Foundation Ireland Conference & Workshop Grant for ‘Music Technology Workshop 2016 (MusTWork16): Establishing a Partnership Between Music Technology, Business Analytics and Industry in Ireland’. Awarded February 2016.

SF1332: UCD Seed Funding Award for ‘Music Technology Workshop 2016’. Awarded February 2016.

### **Education**

#### ***PhD in Computer Science***

**University of Limerick**

**2005 – 2009 (Graduated Jan 2010)**

My PhD Thesis employed digital signal processing and artificial intelligence techniques in examining and classifying real musical instrument sounds. With methods such as Artificial Neural Networks, Principal Component Analysis, Genetic Algorithms and Genetic Programming I determined the best timbral features to use for instrument recognition, thus offering some insight into timbre. My experiments were conducted in Matlab and compared against human listening tests. In addition to publishing my thesis, my results were published at a number of national and international conferences where I had the opportunity to present my work to the academic community.

#### ***Masters in Music and Media Technology***

**Trinity College Dublin**

**2002 – 2004**

During this Masters course I gained experience in a number of audio and visual packages including CubaseSX, Logic8, ProTools, CSound, Sibelius, SoundForge, PhotoShop and Premiere as well as micing and recording instruments. My thesis included a dissertation on auditory streaming and a composition for a group of live musicians with electronic accompaniment.

#### ***Bachelors Degree in Electronic Engineering***

**University College Dublin**

**1997 – 2001**

### **Achievements and Activities**

- Member of the steering committee for Musical Metacreation (MuMe) and Computer Simulation of Musical Creativity (CSMC).
- Regular reviewer for the Journal in Applied Soft Computing, the Journal of Creative Music Systems, MuMe, CSMC and EvoMUSART.
- Registered expert with the European Commission.
- Honours in Grade 8 examination in violin and Grade 5 examination in piano from the Royal Irish Academy of Music.
- As an avid Terry Pratchett fan I help organise the bi-annual Irish Discworld Convention.

## Publications:

## Journal Papers:

\* R. Loughran, A. Agapitos, A. Kattan, A. Brabazon and M. O'Neill (2017), 'Feature selection for speaker verification using genetic programming.' *Evolutionary Intelligence*, 1-21.

\* R. Loughran and M. O'Neill (2017) 'Limitations from Assumptions in Generative Music Evaluation', *Journal of Creative Music Systems*, 2(1).

## Peer Reviewed Conference Papers:

\* R. Loughran and M. O'Neill 'Application Domains Considered in Computational Creativity', in *International Conference on Computational Creativity (ICCC)*, Atlanta, June 2017.

\* R. Loughran and M. O'Neill 'MyLittle ChuckKy: Towards Live Coding with Grammatical Evolution', in *Musical Meta-Creation (MUME)*, Atlanta, June 2017.

\* R. Loughran and M. O'Neill 'Clustering Agents for the Evolution of Autonomous Musical Fitness', in Proceedings of EvoMUSART17, Amsterdam. Published in *Evolutionary and Biologically Inspired Music, Sound, Art and Design*. Springer International Publishing, 2017. 160-175.

\* R. Loughran and M. O'Neill 'The Popular Critic: Evolving Melodies with Popularity Driven Fitness Function', in *Musical Meta-Creation (MUME)*, Paris, June 2016.

\* R. Loughran and M. O'Neill 'Generative Music Evaluation: Why do we Limit to 'Human'?' in *Computer Simulation of Musical Creativity (CSMC)*, Huddersfield, UK, June 2016.

\* R. Loughran, J. McDermott and M. O'Neill 'Grammatical Music Composition with Dissimilarity Driven Hill Climbing', in Proceedings of EvoMusart16 in Porto, Portugal, May 2016. Published in *Evolutionary and Biologically Inspired Music, Sound, Art and Design*. Springer International Publishing, 2016. 110-125.

\* R. Loughran, A. Agapitos, A. Kattan, A. Brabazon and M. O'Neill 'Speaker Verification on Unbalance Data with Genetic Programming', in Proceedings of EvoIASP16 in Porto, Portugal, May 2016. Published in *Applications of Evolutionary Computation*. Springer International Publishing, 2016. 737-753. (**Best Paper Nomination**)

\* R. Loughran, J. McDermott and M. O'Neill, 'Grammatical Evolution with Zipf's Law Based Fitness for Melodic Composition', in Proceedings of the *Sound and Music Computing Conference (SMC)*, Maynooth, July 2015.

\* R. Loughran, J. McDermott and M. O'Neill, 'Tonality Driven Piano Compositions with Grammatical Evolution', in Proceedings of *IEEE Congress on Evolutionary Computation (CEC)*, Sendai, Japan, May, 2015.

\* R. Loughran, J. Walker, M. O'Neill and J. McDermott, 'Genetic Programming for Musical Instrument Identification', in Proceedings of EvoMusart12 in Malaga, April 2012. Published in

*'Evolutionary and Biologically Inspired Music, Sound, Art and Design', Lecture Notes in Computer Science, 2012, Volume 7247/2012, 176-186.*

\* R. Loughran, J. Walker and M. O'Neill, 'An Exploration of Genetic Algorithms for Efficient Musical Instrument Identification', in Proceedings of the *Irish Signal and Systems Conference (ISSC)*, in Dublin, Ireland, June 2009.

\* R. Loughran, J. Walker and M. O'Neill, 'The Use of Mel-frequency Cepstral Coefficients in Musical Instrument Recognition', in Proceedings of the *International Computer Music Conference (ICMC)* in Belfast, Northern Ireland, August 2008.

\* R. Loughran, J. Walker, M. O'Neill and M. Farrell, 'Musical Instrument Identification Using Principal Component Analysis and Multi-Layered Perceptrons', in Proceedings of the *International Conference on Audio, Language and Image Processing (ICALIP)*, in Shanghai, China, July 2008.

\* R. Loughran, J. Walker, M. O'Neill and M. Farrell, 'Comparison of Features in Musical Instrument Identification Using Artificial Neural Networks', in Proceedings of *Computer Music Modelling and Retrieval (CMMR)* in Copenhagen, Denmark, May 2008.

### **PhD Thesis:**

\* R. Loughran, 'Musical Instrument Identification with Feature Selection Using Evolutionary Methods', PhD Dissertation, University of Limerick, 2010. Supervised by Dr Jacqueline Walker and Prof. Michael O'Neill.

### **Workshops and Invited Talks:**

Invited Panel Co-ordinator for discussion on 'Issues in the Evaluation of Creative Music Systems', at Computer Simulation of Musical Creativity (CSMC), Milton Keynes, UK, September 2017.

'Evolving Live Code in Chuck with Grammatical Evolution', presented at ISSTA International Festival and Conference on Sound in the Arts, Science and Technology, DkIT, September 2017.

'Random Access Melodies: At the Intersection Between Music and Machine Intelligence', Institute for Discovery, UCD, 15<sup>th</sup> December 2016 (*invited seminar with Dr James McDermott*)

'MusTWork16: Establishing a Partnership Between Music Technology, Business Analytics and Industry in Ireland', presented at ISSTA International Festival and Conference on Sound in the Arts, Science and Technology, Derry, September 2016.

'When The Means Justifies the End: Why We Must Evaluate on More than Mere Output' to be presented at HORSE2016, London, September 19th 2016, (*invited talk*)

Invited Panel member for discussion on 'Evaluation of Creative Music Systems', at Computer Simulation of Musical Creativity (CSMC), Huddersfield, UK, June 2016.

'Grammatical Evolution for the Composition of Piano Melodies', *Digital Research in the Arts and Humanities (DRHA)*, DCU, September 2015

'Evolving Musical Instrument Classifiers with Genetic Programming', in the Irish Workshop on Music and Audio Signal Processing in Dublin, Trinity College Dublin, Ireland, January 2011.